danger of being surrounded and caught in a mass of anchor ice, and carried down helpless by the stream into the rapids.

The growth of anchor ice is exceedingly beautiful, taking place in arborescent forms resembling bushy weeds. So hard and thick does it become that it is often very difficult to thrust a sounding rod thru it. It is very granular in structure, as is shown by an examination of the masses that rise to the surface. Thru clear water the ice looks weed-like, with long tentacles rising up out of the mass. It often has immense power in lifting rocks and boulders bodily up, and many of these are carried far down stream, attached to irregular masses of ice. The spongy character of adhering frazil crystals and anchor ice causes them to accumulate slime and infusorial growths from the water, imparting a general brown color to the masses.

If the various facts of common observation in connection with anchor ice be considered, it will be seen that everything points to radiation as the prime cause for its formation. Thus, a bridge or cover prevents the forming of ice underneath. Such a cover acts as a check to radiation, and reflects the heat waves back again to the bottom. Anchor ice rarely grows under a layer of surface ice unless this is clear. It forms on dark rocks more readily than on light ones, which is in accord with what we know in regard to the more copious radiation of heat from dark surfaces. Anchor ice rarely forms under a cloudy sky, either by day or night, no matter how severe the weather, but it forms very rapidly under a clear sky at night. Anchor ice is readily melted off under a bright sun. It seems highly probable then that radiation of heat supplies the necessary cooling to the bottom of a river to form the first layers of ice, after which the growth or building up of the ice is aided by the entangling and freezing of frazil crystals always present in the water. This applies, of course, only to water flowing too swiftly for surface ice to form. The formation of a surface sheet below a stretch of open water or rapids serves to collect immense masses of the fine frazil ice.

Frequently serious damming of the water occurs by the complete stoppage of the channels under the ice. This brings about a rise of water level until sufficient weight has accumulated to enable the water to drive the barrier before it and force a channel for itself. Floods occur as a result of these winter shoves, and frequently occasion considerable damage to property along the river side. The fine frazil ice reaches great depths in many parts of the St. Lawrence River near Montreal, where it is carried under the surface ice by the swift currents of the rapids. Accumulations 80 feet deep, extending from the surface ice to the bottom of the river, were recorded by the members of the Montreal Flood Commission in 1888.

The depth of formation of anchor ice appears to be from forty to forty-five feet in the fresh waters of the Canadian rivers. Along the coast of Newfoundland it has been observed to form as deep as 70 feet in the clearer salt water. The temperature of the water on the bottom need not be exactly at the freezing point for anchor ice to form, the cooling of the bottom by radiation being sufficient to bring it to the freezing point, notwithstanding the slow conduction of heat from the earth.

## WEATHER BUREAU MEN AS EDUCATORS.

The following lectures and addresses by Weather Bureau men are reported:

Mr. J. Cecil Alter, May 25, 1906, before the Monday Night Literary Club of Salt Lake City, Utah; also October 23, 1906, before the convention of the Utah Federation of Women's Clubs, at Park City, Utah, on "Some Inside Information on the Weather Outside", illustrated with large hand-made drawings.

Mr. H. W. Richardson, October 4, 1906, before pupils and teachers of the Blaine High School, Superior, Wis., on "The United States Weather Bureau and its Work".

Mr. J. Warren Smith, October 20, 1906, before the Engineer's Club of Columbus, Ohio, on "The Work of the Weather Bureau", illustrated.

Mr. P. H. Smyth, October 27, 1906, before the Farmers' and Teachers' Institute, Olive Branch, Ill., on "Value and Utility of United States Weather Bureau Forecasts and Warnings".

Mr. F. T. Williams, October 26, 1906, before the Church Club, of St. Paul, Minn., on "The Weather Bureau and its Work".

Mr. L. H. Daingerfield, November 19, 1906, before the physiography class of the Centennial High School, Pueblo, Colo., on "The Work of the United States Weather Bureau".

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Classes from schools and academies and parties of teachers have visited Weather Bureau offices, to study the instruments and equipment and receive informal instruction, as reported from the following offices:

Boise, Idaho, August 4 and 9, 1906, students from the joint Summer School and Teachers' Institute for southwestern Idaho; also October 27, the physical geography class from the Cole School.

Buffalo, N. Y., October 13, 1906, members of Junior Division No. 2, Boys' Department of the local Young Men's Christian Association.

Cairo, Ill., September 5, 1906, a party of teachers from the Alexander County Teachers' Institute.

Columbus, Ohio, October 23, 1906, a class of special students from the South High School.

Duluth, Minn., September 13, 1906, about thirty-five students of the Freshman class, Duluth State Normal School.

Indianapolis, Ind., October 10, 15, and 17, 1906, the physical geography classes of the Shortridge High School.

Oklahoma, Okla., October 22, 1906, the physical geography class of the Epworth University Academy.

Salt Lake City, Utah, during the school year 1905–6, about five hundred students from the Latter Day Saints' College, the city graded and high schools, the University of Utah, and the district schools of near-by towns.

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## RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

**Associacion de Ingenieros y Arquitectos de Mexico.**
Anales. Tomo 13. Mexico. 1905. 310 pp. 8°.

**Bastin, S. Leonard.**
The effects of civilization upon climate. (Monthly review. London. v. 24, September, 1906. Pp. 116–124.)

**Beach, Harlan P[age].**
A geography and atlas of Protestant missions. 2 vols. viii, 571; 54 pp. 18 pl.

**Belgium. Observatoire Royal de Belgique.**
Annuaire météorologique. 1905. Bruxelles. 1905. vii, 704 pp. 24°.
Same. 1906. Bruxelles. 1906. vii, 599 pp. 24°.

**Bolivia. Ministerio de Colonizacion y Agricultura.**
Estudio sobre la climatología de La Paz por Victor E. Marchant Y. La Paz. 1906. 48 pp. 8°.

**Bos, H.**
Zur Kritik der Lehre von den thermischen Vegetations-Konstanten auch in Bezug auf Winterruhe und Belaubungstrieb der Pflanzen. (S. A.- Verh. des bot. Vereins Brandenburg.) 48 Jahr. 1906. Pp. [62–90]. 8°.

**Bowker, R[ichard] R[ogers].**
Publications of societies. New York. 1899. v, 181 pp. 8°.

**Bracke, Albert.**
A la recherche de courants d'air. Mons. [1906.] 93 pp. 8°.

**Bremen.**
Deutsches meteorologisches Jahrbuch. 1905. Bremen. 1906. xvi, 126 pp. f°.

**Chaumeil, J.**
Météorologie usuelle. Paris. n d. 177 pp. 12°.

**Courmont, Jules and Lesieur, Ch.**
Atmosphère et climats. (Brouardel and Mosny, Traité d'hygiène. I.) Paris. 1906. 124 pp. 8°.

**Denmark. Danske Meteorologiske Institut and Hamburg. Deutsche Seewarte.**
Tägliche Synoptische Wetterkarten für den Nordatlantischen Ozean. Copenhague. 1906. n. p. f°.

**Eredia, Filippo.**
Sulla direzione delle correnti atmosferiche in Catania. (Repr. Atti Accad. Gioen. Catania.) [1906.] 13 pp. f°.

**Geographic Society of Baltimore.**
The Bahama Islands. New York. 1905. xxxii, 630 pp. 4°.

**Gironde. Commission Météorologique.**
Observations pluviométriques et thermométriques ... 1905-6. Bordeaux. 1906. 63 pp. 8°.

**Great Britain. Meteorological Office.**
Hourly readings obtained from the self-recording instruments at four observatories in connection with the Meteorological Office, 1904. 36th year; new series. v. 5. London. 1906. xiii, 199 pp. 4°.

**Haid, M.**
Die seismischen Stationen Durlach und Freiburg i. B. Karlsruhe i. B. 1906. 25 pp. 8°.

**Henze, H.**
Ueber die Niederschlagswahrscheinlichkeit in Schlesien. (S. A.-Jahresb. Schles. Gesell. Breslau.) 1905. pp. 13-20. 8°.

**Huggard, William R.**
A handbook of climatic treatment, including balneology. London. 1906. xvi, 536 pp. 8°.

**India. Meteorological Department.**
Report on the administration ... 1905-6. [Simla.] 1906. 19 pp. f°.

**Kaiser, Max.**
Land-und Seewinde an der deutschen Ostseeküste. Halle a. S. 1906. 22 pp. 4°.

**Kienast, Hermann.**
Das Klima von Königsberg i. Pr. Teil I. Königsberg. 1898. 64 pp. f°.
Same Teil II. Königsberg. 1904. 39 pp. 8°.

**Loisel, Julien.**
Guide de l'amateur météorologiste. Paris. 1906. vi, 101 pp. 8°.

**Mendola, Luigi.**
La pioggia in Catania dal 1865 al 1900. Catania. 1902. 76 pp. f°.

**Mendola, Luigi and Eredia, Filippo.**
La temperatura in Catania dal 1817 al 1900. Catania. 1901. 42 pp. f°.
Andamento annuale della differenza di temperatura fra gli osservatori meteorichi della R. Università degli studj in Cantania. Catania 1900. 17 pp. f°.

**Munich. K. Sternwarte.**
Meteorologische ... für die Jahre 1901-1905. München. 1906. viii, 54 pp. f°.

**Mysore. Meteorological Department.**
Meteorology in Mysore for 1905. Bangalore. 1906. xvii, 56 pp. f°.
Report on rainfall registration in Mysore for 1905. Bangalore. 1906. xiv, 29 pp. f°.

**Nevada Agricultural Experiment Station.**
The weather for 1905. By S. B. Doten. Reno, Nevada. 1906. 19 pp. 8°.

**Odessa. Meteorological and Magnetical Observatory.**
Annales. 1904. Odessa. 1906. 53 pp. 4°.

**Oxford. Geographical Institute.**
Oxford atlas of the British Colonies. Part 1. British Africa. Oxford. n. d. n. p. f°.

**Pollock, J. A.**
Note on a hollow lightning conductor crushed by the discharge. (Repr. Journ. Roy. soc. New South Wales. v. 39.) 1905. Pp. 131-138. 8°.

**Ricco, A[nnibale].**
Eruzioni e pioggie. (Repr. Atti Accad. Gioen. Catania.) n. p. 13 pp. f°.
Riassunto delle osservazioni meteorologiche fatte all'Osservatorio Etneo. (Estr. Rendic. R. accad. Lincei. Roma. v. 5, 1 sem., ser. 5, fasc.8.) 1896. Pp. [306]-318. 4°.

**Ricco, A[nnibale] and Mondola, L.**
Trasparenza relative dell'aria atmosferica. (Estr. Mem. Soc. spettro. Ital. v. 33. Anno 1904.) Pp. 159-163. f°.

**Ricco, A[nnibale] and others.**
Risultati delle osservazioni meteorologiche del 1900-1905 fatte nel R. Osservatorio di Catania. (Repr. Atti Accad. Gioen. Catania.) v. p. f°.

**Ricco, A[nnibale] and Saya G.**
Osservazioni meteorologiche orarie simultanée in quattro stazioni da Catania alla cima dell'Etna. (Estr. Rendic. R. Accad. dei Lincei.) 1898. Pp. [103]-111. 4°.
Osservazioni termometriche esequite del R. Osservatorio Etneo. (Boll. Accad. Gioen. Catania.) 1894. 6 pp. 8°.

**Sagnier, [Henry].**
Le régime des pluies et les récoltes en Russie. (Bull. des séances de la Société nationale d'agriculture de France. Paris. Année 1906. Tome 66. Pp. [32]-37.)

**South Australia. Government Astronomer.**
Rainfall in South Australia and the northern territory during 1904. Adelaide. 1906. Pp. 59-95. f°.

**Sundell, A. F.**
Vergleichungen zwischen Normalbarometern. (Acta. Helsingfors. T. 34. No. 2.) Helsingfors. 1906. 59 pp. 4°.

**Western Australia. Government Astronomer.**
Meteorological observations made at the Perth observatory and other places in Western Australia, 1904. Perth. 1906. 144 pp. f°.

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## RECENT PAPERS BEARING ON METEOROLOGY.

H. H. KIMBALL, Librarian.

**The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——**

*Aeronautical Journal. London. Vol. 10. Oct., 1906.*
—— The development of the kite and the forthcoming kite display. Pp. 54-56.

*American Journal of Science. New Haven. 4 series. Vol. 22. Oct., 1906.*
**Barus, C[arl].** Note on the actual drop of pressure in the fog chamber. Pp. 339-341.
**Barus, C[arl].** On a new method for standardizing the coronas of cloudy condensation. Pp. 342-343.

*Egypt. Survey Department. Supplement to the monthly summary. Cairo. June, 1906.*
**Keeling, B. F. E.** Note on the khamsins of March to June, 1906. 4 pp.

*Electrical World. New York. Vol. 48. Nov. 10, 1906.*
—— Locating the magnetic pole. Pp. 907-908.

*Geographical Journal. London. Vol. 28.*
**McMahon, Henry.** Recent survey and exploration in Seistan. (Sept., 1906. Pp. 209-228.) (Oct., 1906. Pp. 333-352.)
**Huntington, Ellsworth.** The rivers of Chinese Turkestan and the desiccation of Asia. Pp. 352-367.
—— The rainfall of Africa. [Review.] Nov., 1906. P. 507.

*Journal of Geography. New York. Vol. 5. Sept., 1906.*
**Ward, Robert DeC[ourcy].** The characteristics of the zones. Pp. 302-319.

*Nature. London. Vol. 74. Oct. 25, 1906.*
—— Aeronautics and meteorology. Pp. 647-648.
—— Meteorology of the Nile Valley. [Review]. Pp. 17-20.

*Physical Review. Lancaster. Vol. 22. Nov., 1906.*
**Barus, Carl.** The moisture precipitated in the fog chamber per cubic centimeter. Pp. 444-446.

*Popular Science Monthly. New York. Vol. 69. Nov., 1906.*
**Ward, Robert DeC[ourcy].** Changes of climate. Pp. 458-470.

*Proceedings of the American Philosophical Society. Philadelphia. Vol. 45. May-Sept., 1906.*
**Abbe, Cleveland.** Benjamin Franklin as meteorologist. Pp. 117-128.
**Davis, William Morris.** Was Lewis Evans or Benjamin Franklin the first to recognize that our northeast storms come from the southwest? Pp. 129-130.

*Quarterly Journal of the Royal Meteorological Society. London. Vol. 32. Oct., 1906.*
**Shaw, W[illiam N[apier].** An instrument for testing and adjusting the Campbell-Stokes sunshine recorder. Pp. 249-257.
**Mill, H[ugh] R[obert].** Rainfall terminology. P. 258.
**Lempfert, R. G. K.** The development and progress of the line-squall of February 8, 1906. Pp. 259-280.
**Dines, William Henry.** Note on a typical squall at Oxschott, May 25, 1906. Pp. 281-284.
—— Lightning statistics for Germany. Pp. 288-289.
—— Condensation from southeast clouds on Table Mountain. [Note on work by Marloty.] P. 290.
—— Cloud banners. [Note.] P. 291.
**Rendell, Fermor.** Rainfall of Durban, Natal. [Monthly and annual values 1871-1905, and normals.] P. 296.
—— Rainfall at Pretoria. [Monthly and annual values, 1892-1905.] Pp. 296-297.